

TEST REPORT

Applicant: TFIVE PTY LTD
Address: 10/29 Lorne Ave Killara NSW 2071 Australia
Equipment Type: Motion Sensor P1
Model Name: MS-S02
Brand Name: Aqara
Test Standard: AS/NZS CISPR 32: 2015+AMD1:2020
Test Date: May 30, 2022 – May 31, 2022
Date of Issue: Jun. 21, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Xiong Chong

Xiong Chong

Checked by: Xia Long

Xia Long

Approved by: Liao Jianming

(Technical Director)

Liao Jianming

Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Jun. 21, 2022</u>	<u>Initial Issue</u>

TABLE OF CONTENTS

1 GENERAL INFORMATION.....	4
1.1 Identification of the Testing Laboratory.....	4
1.2 Identification of the Responsible Testing Location	4
2 PRODUCT INFORMATION	5
2.1 Applicant Information.....	5
2.2 Manufacturer Information	5
2.3 Factory Information	5
2.4 General Description for Equipment under Test (EUT).....	5
2.5 Ancillary Equipment.....	6
2.6 Technical Information	6
3 SUMMARY OF TEST RESULTS	7
3.1 Test Standards.....	7
3.2 Verdict.....	7
3.3 Test Uncertainty	7
4 GENERAL TEST CONFIGURATIONS.....	8
4.1 Test Environments,Test Date and Test Engineer	8
4.2 Test Equipment	8
4.3 Test Enclosure list	9
4.4 Test Configurations	9
4.5 Test Setups	10
4.6 Test Conditions	13
5 TEST ITEMS.....	14
5.1 Emission Tests	14
ANNEX A TEST RESULTS.....	18
A.1 Radiated Emission	18

A.2 Conducted disturbance voltage at mains terminals Test	22
A.3 Conducted disturbance for asymmetric mode	22
A.4 Conducted differential voltage emission.....	22
ANNEX B TEST SETUP PHOTOS	23
ANNEX C EUT EXTERNAL PHOTOS.....	23
ANNEX D EUT INTERNAL PHOTOS	23

1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Description	All measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	TFIVE PTY LTD
Address	10/29 Lorne Ave Killara NSW 2071 Australia

2.2 Manufacturer Information

Manufacturer	Lumi United Technology Co., Ltd.
Address	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Motion Sensor P1
Model Name Under Test	MS-S02
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V3
Software Version	0.0.0_0005
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	Panasonic
	Model No.	CR2450
	Serial No.	N/A
	Capacity	620 mAh
	Rated Voltage	3.0 V
	Limit Charge Voltage	N/A

2.6 Technical Information

Network and Wireless connectivity	Bluetooth, Zigbee	
Interfaces present on the EUT	AC Ports	No AC Ports.
	DC Ports	No DC Ports.
	I/O Ports	No I/O Ports.
	Telecom Ports	No Tel ports.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	AS/NZS CISPR 32: 2015+AMD1:2020	Electromagnetic compatibility of multimedia equipment — Emission requirements

3.2 Verdict

No.	Base Standard	Description		Test Verdict	Result	Remark
Emission						
1	CISPR 32	Radiated Emission	Below 1 GHz	Pass	ANNEX A.1	--
			Above 1 GHz	Pass		Note 1
2	CISPR 32	Conducted Emission	Mains terminals	N/A	ANNEX A.2	--
			Asymmetric mode	N/A	ANNEX A.3	Note 2
			Differential voltage	N/A	ANNEX A.4	Note 3
Note 1: The highest frequency of the internal sources of the EUT is above 108 MHz, the measurement shall be made above 1 GHz. Note 2: For cables longer than 3 m only. Note 3: For Class B broadcasting receiver only.						

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)-AMN	3.22 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT3	3.66 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT5	4.10 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT6	4.58 dB
Radiated emissions (30 MHz-1 GHz)-10m	4.80 dB
Radiated emissions (30 MHz-1 GHz)-966#2	4.76 dB
Radiated emissions (30 MHz-1 GHz)-966#4	4.38 dB
Radiated emissions (1 GHz-18 GHz)-10m	4.72 dB
Radiated emissions (1 GHz-18 GHz)-966#2	4.88dB
Radiated emissions (1 GHz-18 GHz)-966#4	5.04 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments, Test Date and Test Engineer

Test items	Voltage	Temperatur e	Relative Humidity	Ambient Pressure	Test Date	Test Engineer
Radiated Emission	From battery	26.7°C 23.6°C	58% 52%	101kPa	May 30, 2022 May 31, 2022	Tian Shuo Huang Zehuai

4.2 Test Equipment

Radiated Emission Test For Frequency Below 1 GHz (10 m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWABE RZ	ESRP	101036	2021.10.10	2022.10.09	<input checked="" type="checkbox"/>
Amplifier (30-1GHz)	COM-MV	ZT30-1000M	B2018054558	2021.10.10	2022.10.09	<input checked="" type="checkbox"/>
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-01162	2020.08.12	2023.08.11	<input checked="" type="checkbox"/>
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2021.08.15	2024.08.14	<input checked="" type="checkbox"/>
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V19.918		<input checked="" type="checkbox"/>

Radiated Emission Test For Frequency Above 1 GHz (3m-966#4)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY53220118	2021.09.13	2022.09.12	<input checked="" type="checkbox"/>
Amplifier (1-12GHz)	COM-MV	DLNAB-1000-12000-002	18080279	2021.09.13	2022.09.12	<input checked="" type="checkbox"/>
Amplifier (0.8-21GHz)	Mini-Circuits	ZVA-213-S+	619201336	2021.09.13	2022.09.12	<input type="checkbox"/>
Amplifier (18-40GHz)	COM-MV	KA_LNA18-40G-01	18050001	2021.10.20	2022.10.19	<input type="checkbox"/>
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	1201	2019.07.22	2022.07.21	<input checked="" type="checkbox"/>
Anechoic Chamber	ChangNing	9m*6m*6m	966#4	2020.03.16	2023.03.15	<input checked="" type="checkbox"/>
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V19.918		<input checked="" type="checkbox"/>

4.3 Test Enclosure list

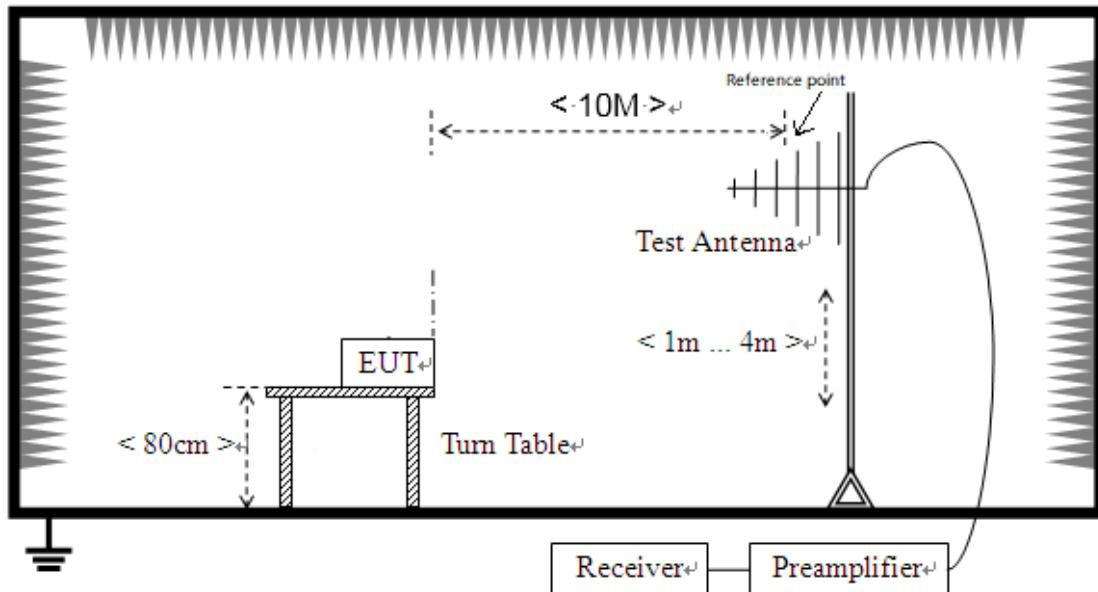
Note: Not applicable.

4.4 Test Configurations

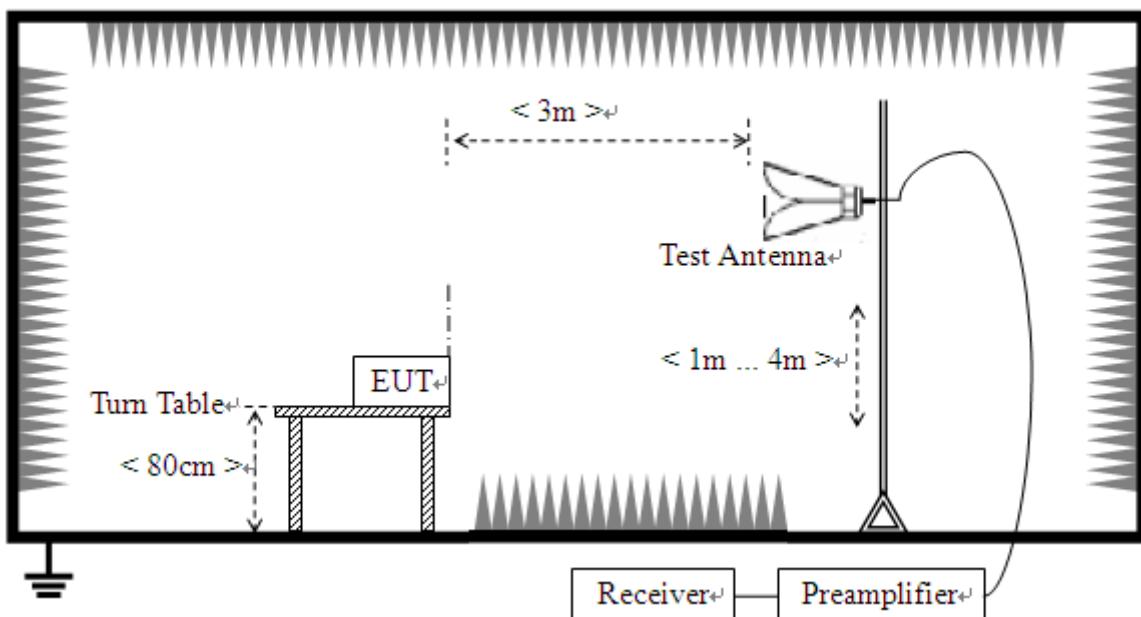
Test Configurations (TC) No.	Description
TC01	<u>The Working Test Mode</u> EUT + Battery

4.5 Test Setups

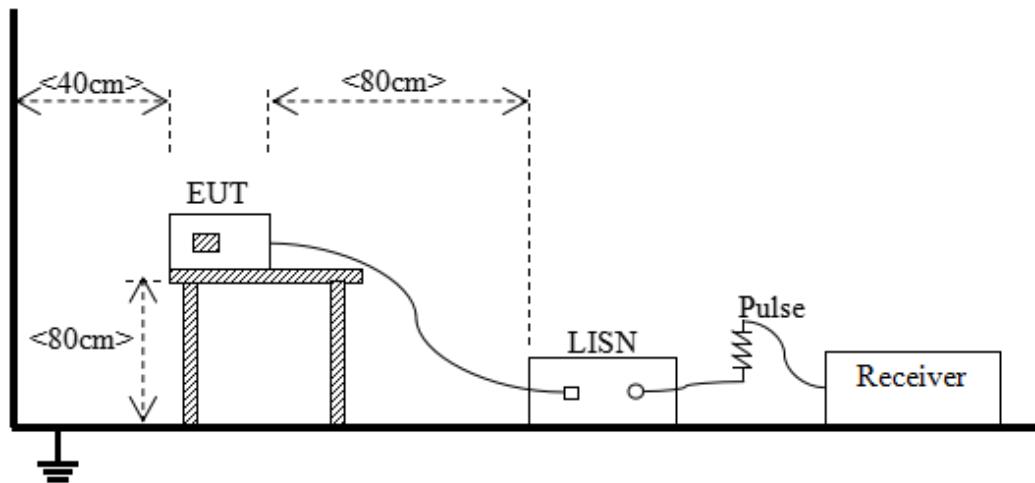
Test Setup 1



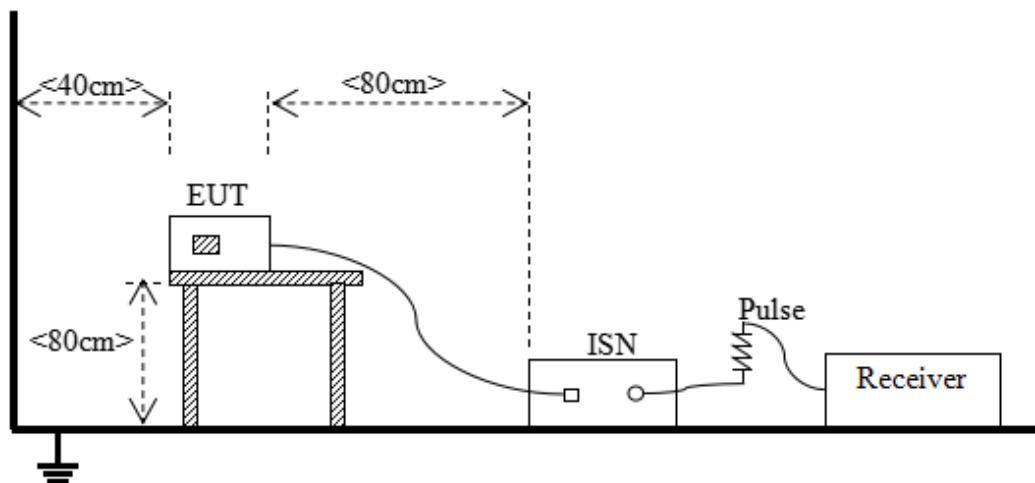
(For Radiated Emission Test (30 MHz-1 GHz))



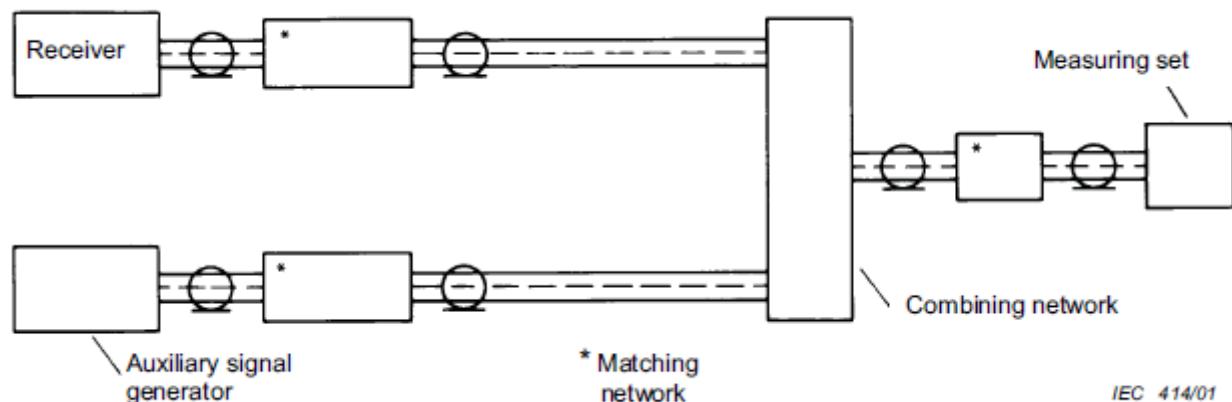
(For Radiated Emission Test (above 1 GHz))

Test Setup 2

(For Conducted disturbance voltage at mains terminals Test)

Test Setup 3

(For Conducted disturbance for asymmetric mode Test)

Test Setup 4

(For Conducted differential voltage emission (TV/FM broadcast receiver tuner ports))

4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission	Test Setup	Test Setup 1
	Test Configuration	TC01 <small>Note</small>

Note: Based on client request, all normal using modes of the normal function were tested, but only the worst test data of test mode is reported in this report. The Working Test Mode is the worst mode in this report.

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class A (10 m)	Class A (3 m)	Class B (10 m)	Class B (3 m)
	Quasi-Peak Limit (dB μ V/m)		Quasi-Peak Limit (dB μ V/m)	
30 - 230	40	50	30	40
230 - 1000	47	57	37	47

Frequency range (MHz)	Class A (at 3 m)		Class B (at 3 m)	
	Peak Limit (dB μ V/m)	Average Limit (dB μ V/m)	Peak Limit (dB μ V/m)	Average Limit (dB μ V/m)
1000-6000	80	60	74	54

Requirements for radiated emissions from FM receivers

Frequency range (MHz)	Measurement		Quasi-Peak Limit (dB μ V/m) Fundamental	Quasi-Peak Limit (dB μ V/m) Harmonics	Quasi-Peak Limit (dB μ V/m) Other
	Facility	Distance (m)			
30-230	OATS/SAC	10	50	42	30
230-300				42	37
300-1000				46	37
30-230	OATS/SAC	3	60	52	40
230-300				52	47
300-1000				56	47

NOTE:

- 1) The lower limit shall apply at the transition frequency.
- 2) Additional provisions may be required for cases where interference occurs.

5.1.1.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 1. The photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Conducted disturbance voltage at mains terminals

5.1.2.1 Test Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dB μ V)	Average (dB μ V)	Quasi-peak (dB μ V)	Average (dB μ V)
0.15 - 0.50	79	66	66-56	56-46
0.50 - 5	73	60	56	46
5 - 30	73	60	60	50

NOTE:

- 1) The lower limit shall apply at the band edges.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 2. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 Conducted disturbance for asymmetric mode

5.1.3.1 Test Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dB μ V)	Average (dB μ V)	Quasi-peak (dB μ V)	Average (dB μ V)
0.15 - 0.50	97-87	84-74	84-74	74-64
0.50 - 30	87	74	74	64

NOTE:

- 1) The lower limit shall apply at the band edges.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.3.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 3. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

Measurement of common mode (asymmetric mode) current or voltage emissions at wired network ports for attachment of unscreened balanced pairs shall be performed with the wired network port connected by a cable to an AAN. The AAN shall define the common mode termination impedance seen by the wired network port during the emission measurements.

The voltage division factor shall be added to the measured voltage measured by the receiver directly at the voltage measurement port of the AAN and the result compared with the voltage limits as applicable.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Conducted differential voltage emission

5.1.4.1 Test Limit

Applicability	Frequency range (MHz)	Differential voltage limit @75Ω(dBuV)		
		Local Oscillator Fundamental	Local Oscillator Harmonics	Other
Television receivers; video recorders; PC TV broadcast receiver tuner cards; Digital audio receivers	30 to 950	46	46	46
	950 to 2150	54	54	46
Tuner units (not the LNB) for satellite signal reception	950 to 2150	54	54	46
FM audio receivers and PC tuner cards	30 to 300	54	50	46
	300 to 1000	54	52	46
FM car radios	30 to 300	66	59	46
	300 to 1000	66	52	46
RF modulator output ports connect to TV broadcast receiver tuner ports	30 to 950	76	46	46
	950 to 2150	N/A	54	46

5.1.4.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 4. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

1. The impedance as seen from the TV/FM broadcast receiver tuner port of the EUT shall be equal to the nominal antenna input impedance for which the port has been designed. The EUT shall be tuned to the wanted signal from the AE (signal generator). The emission level shall be measured across the relevant frequency range taking into account the attenuation between the EUT TV/FM broadcast receiver tuner port and the measurement device.
2. The RF modulator output port of the EUT is connected to the input of the measuring device by means of a coaxial cable and a matching network (if necessary). The characteristic impedance of the cable shall be equal to the nominal output impedance of the EUT. The EUT shall produce an RF carrier modulated by a video signal defined. The RF output level shall be obtained by adding the insertion loss of the matching network to the indication of the measuring device (tuned to the video carrier frequency and its harmonics).

5.1.4.4 Test Result

Please refer to ANNEX A.4.

ANNEX A TEST RESULTS

A.1 Radiated Emission

Note 1: The symbol of “--” in the table which means not application.

Note 2: Measurements shall be made with a quasi-peak measuring receiver in the frequency range 30 MHz to 1000 MHz.

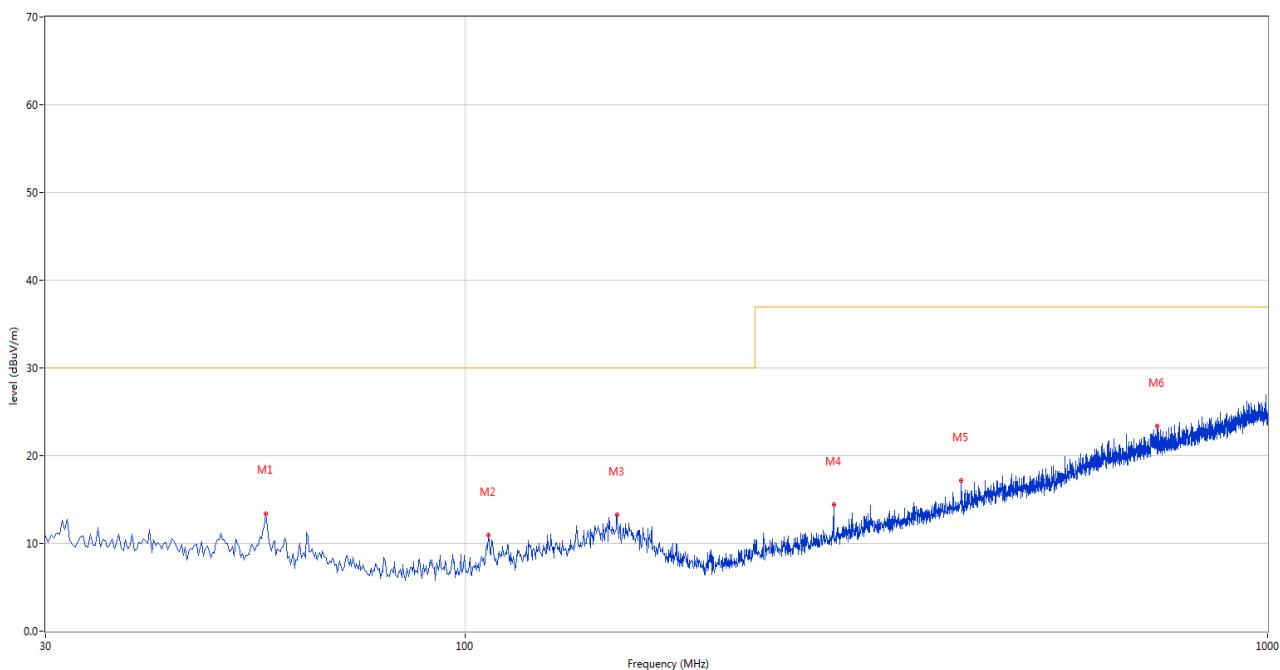
To reduce the testing time, a peak measuring receiver may be used instead of a quasi-peak measuring receiver. In case of dispute, measurement with a quasi-peak measuring receiver will take precedence.

Note 3: The marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth or Zigbee carrier frequencies.

Test Data and Plots (Below 1 GHz)

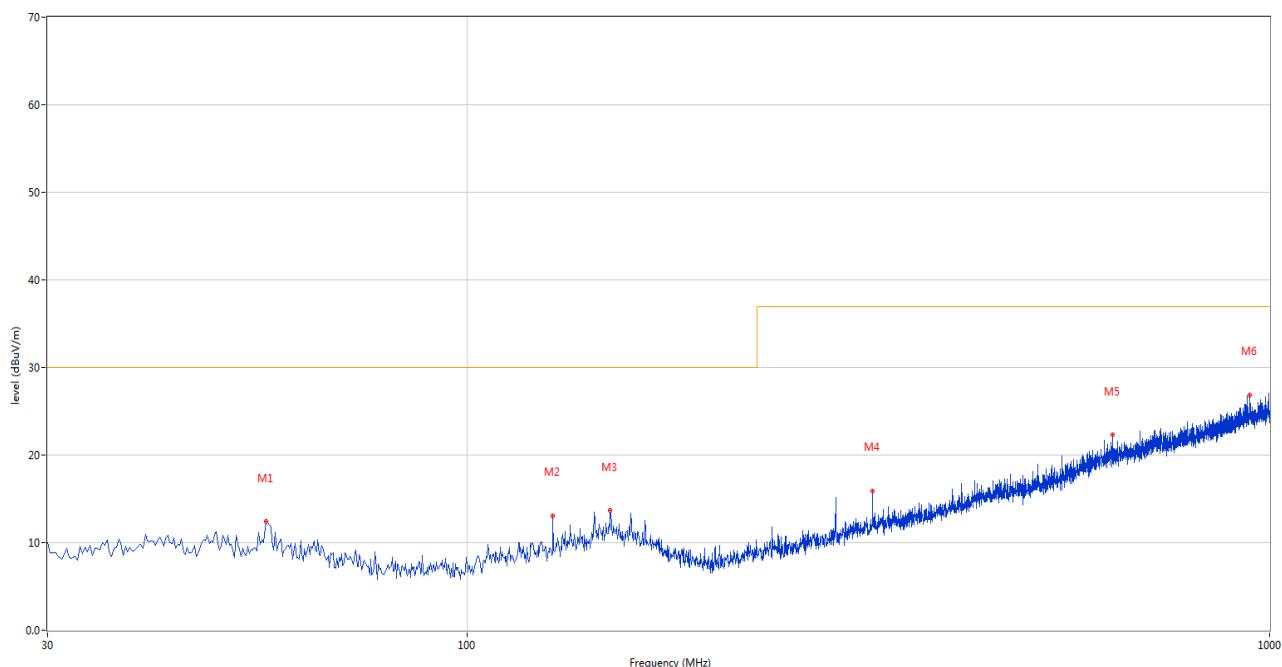
The Working Test Mode

A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	56.426	13.41	-27.51	30.0	-16.59	Peak	135.00	100	Vertical	Pass
2	106.853	10.93	-29.40	30.0	-19.07	Peak	149.00	200	Vertical	Pass
3	154.614	13.24	-25.68	30.0	-16.76	Peak	0.00	100	Vertical	Pass
4	287.956	14.41	-25.97	37.0	-22.59	Peak	360.00	200	Vertical	Pass
5	415.236	17.14	-22.31	37.0	-19.86	Peak	295.00	200	Vertical	Pass
6	727.741	23.33	-15.24	37.0	-13.67	Peak	189.00	200	Vertical	Pass

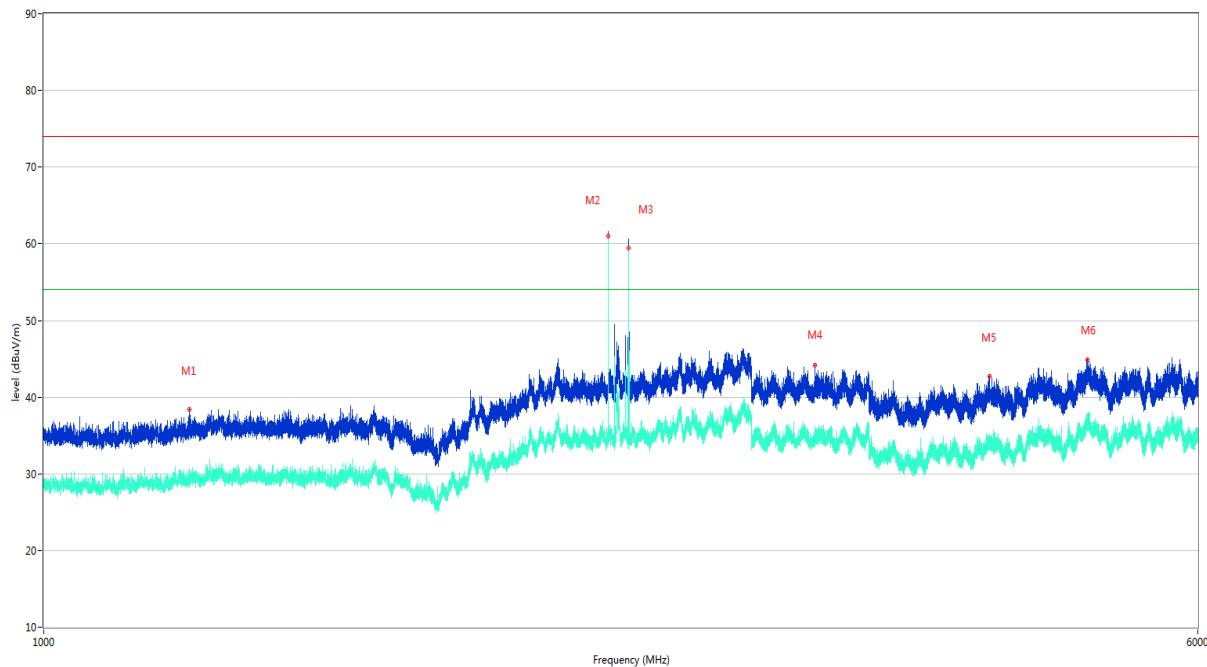
A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	56.183	12.41	-27.46	30.0	-17.59	Peak	161.00	100	Horizontal	Pass
2	127.946	13.09	-27.33	30.0	-16.91	Peak	30.00	100	Horizontal	Pass
3	150.735	13.63	-25.63	30.0	-16.37	Peak	146.00	100	Horizontal	Pass
4	319.958	15.90	-24.94	37.0	-21.10	Peak	360.00	200	Horizontal	Pass
5	637.796	22.28	-16.91	37.0	-14.72	Peak	9.00	100	Horizontal	Pass
6	944.724	26.85	-11.34	37.0	-10.15	Peak	360.00	200	Horizontal	Pass

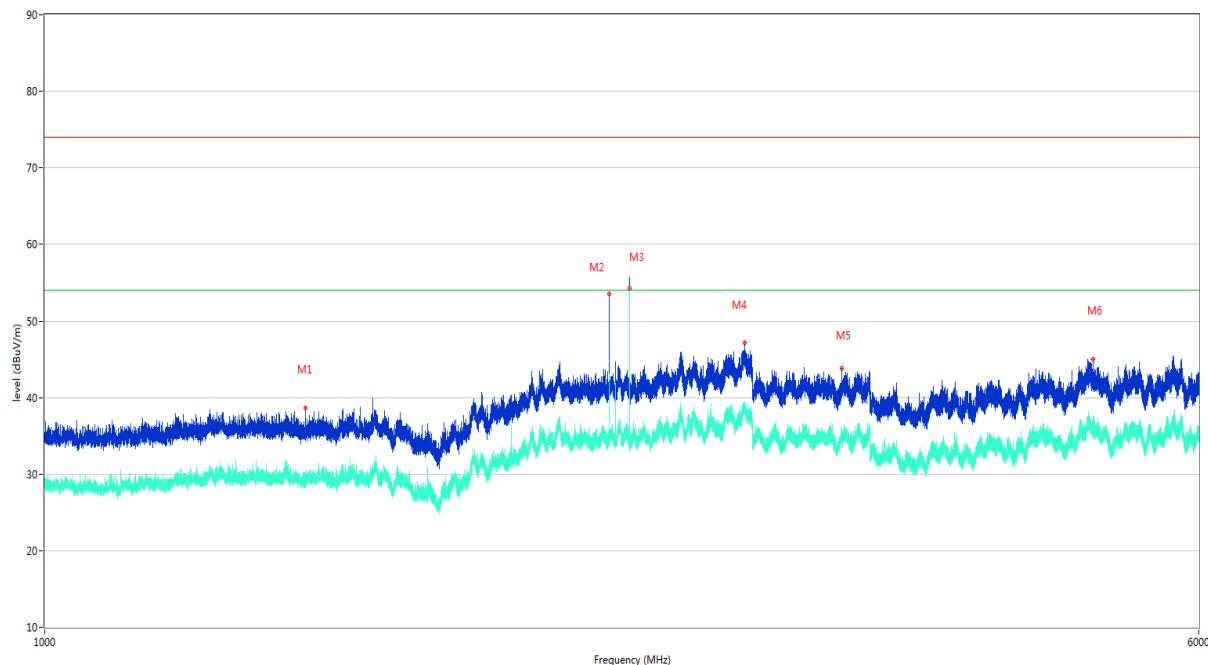
Test Data and Plots (Above 1 GHz)

A.1.3 Test Antenna Vertical, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1253.800	38.33	-15.76	74.0	-35.67	Peak	198.80	100	Vertical	Pass
1**	1253.800	28.28	-15.76	54.0	-25.72	AV	198.80	100	Vertical	Pass
2	2402.100	61.33	-9.25	74.0	-12.67	Peak	253.60	100	Vertical	N/A
2**	2402.100	60.98	-9.25	54.0	6.98	AV	253.60	100	Vertical	N/A
3	2479.600	59.84	-9.78	74.0	-14.16	Peak	118.00	100	Vertical	N/A
3**	2479.600	54.32	-9.78	54.0	0.32	AV	118.00	100	Vertical	N/A
4	3311.100	44.13	-8.22	74.0	-29.87	Peak	336.40	100	Vertical	Pass
4**	3311.100	34.44	-8.22	54.0	-19.56	AV	336.40	100	Vertical	Pass
5	4340.700	42.72	-4.57	74.0	-31.28	Peak	103.40	100	Vertical	Pass
5**	4340.700	34.29	-4.57	54.0	-19.71	AV	103.40	100	Vertical	Pass
6	5053.800	44.85	-3.20	74.0	-29.15	Peak	246.80	100	Vertical	Pass
6**	5053.800	37.12	-3.20	54.0	-16.88	AV	246.80	100	Vertical	Pass

A.1.4 Test Antenna Horizontal, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1498.500	38.62	-15.48	74.0	-35.38	Peak	281.00	100	Horizontal	Pass
1**	1498.500	29.15	-15.48	54.0	-24.85	AV	281.00	100	Horizontal	Pass
2	2403.100	53.55	-9.10	74.0	-20.45	Peak	80.40	100	Horizontal	N/A
2**	2403.100	34.63	-9.10	54.0	-19.37	AV	80.40	100	Horizontal	N/A
3	2480.300	55.30	-9.75	74.0	-18.7	Peak	150.90	100	Horizontal	N/A
3**	2480.300	54.32	-9.75	54.0	0.32	AV	150.90	100	Horizontal	N/A
4	2964.200	47.14	-5.22	74.0	-26.86	Peak	291.80	100	Horizontal	Pass
4**	2964.200	38.61	-5.22	54.0	-15.39	AV	291.80	100	Horizontal	Pass
5	3444.900	43.83	-7.04	74.0	-30.17	Peak	259.20	100	Horizontal	Pass
5**	3444.900	34.63	-7.04	54.0	-19.37	AV	259.20	100	Horizontal	Pass
6	5089.200	45.03	-3.21	74.0	-28.97	Peak	136.40	100	Horizontal	Pass
6**	5089.200	35.26	-3.21	54.0	-18.74	AV	136.40	100	Horizontal	Pass

A.2 Conducted disturbance voltage at mains terminals Test

Note: Not applicable.

A.3 Conducted disturbance for asymmetric mode

Note: Not applicable.

A.4 Conducted differential voltage emission

Note: Not applicable.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2240345-AE.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2240345-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2240345-AI.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--